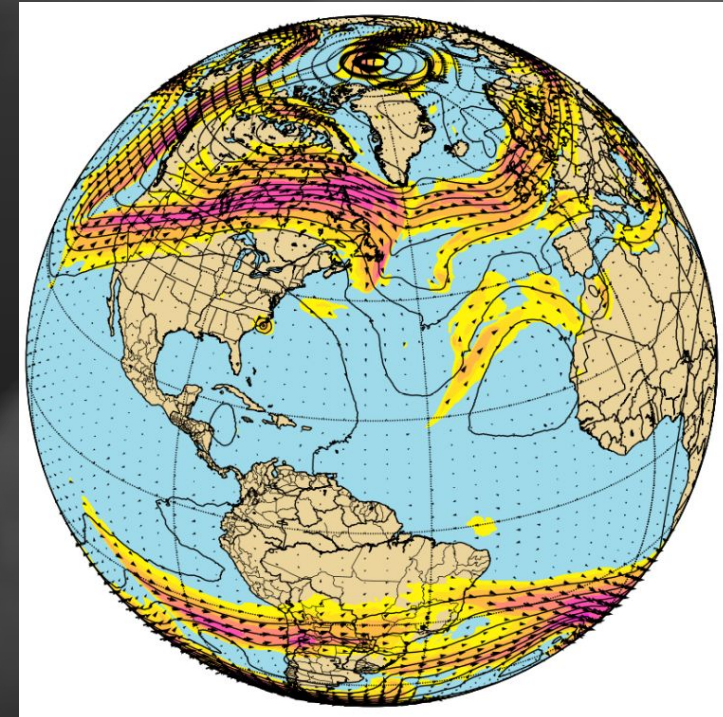
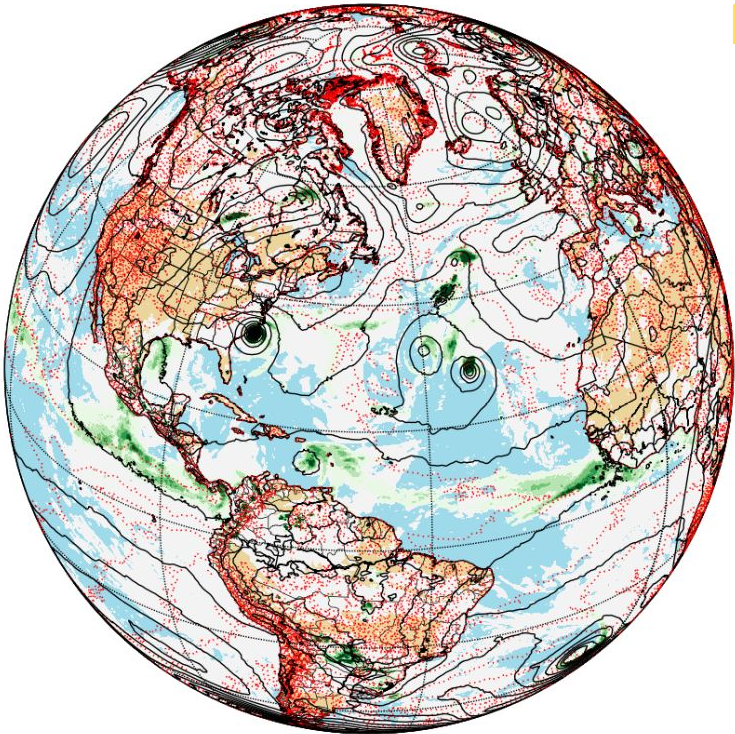


USAF Modeling Updates

16th Weather Squadron Advancements in Providing
Actionable Environmental Intelligence for Unique Air
Force and Army Mission Requirements



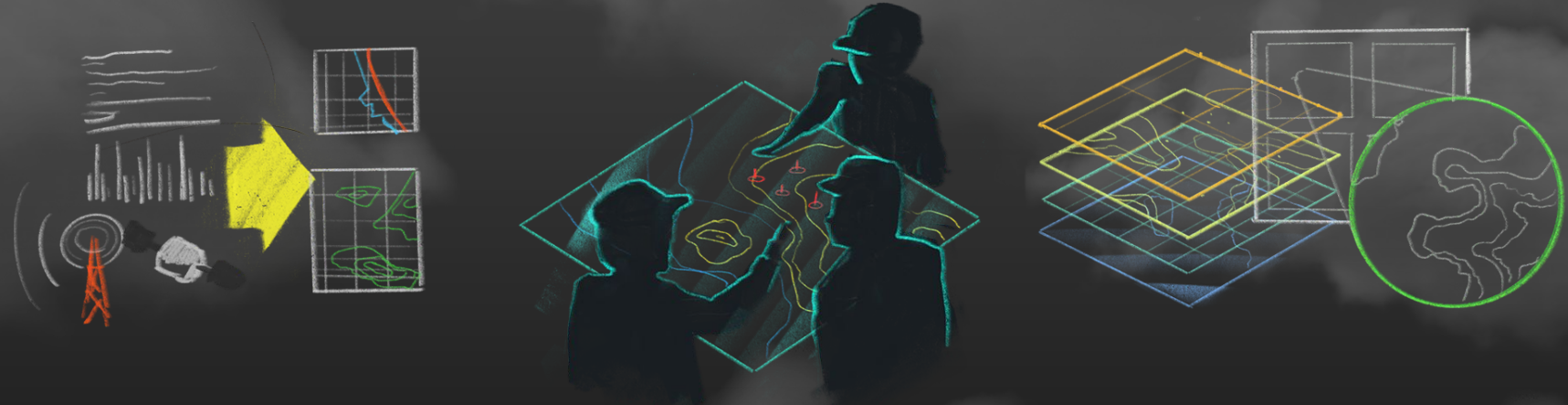
Mr. Evan Kuchera
On Behalf of
16th Weather Squadron



Mission / Vision

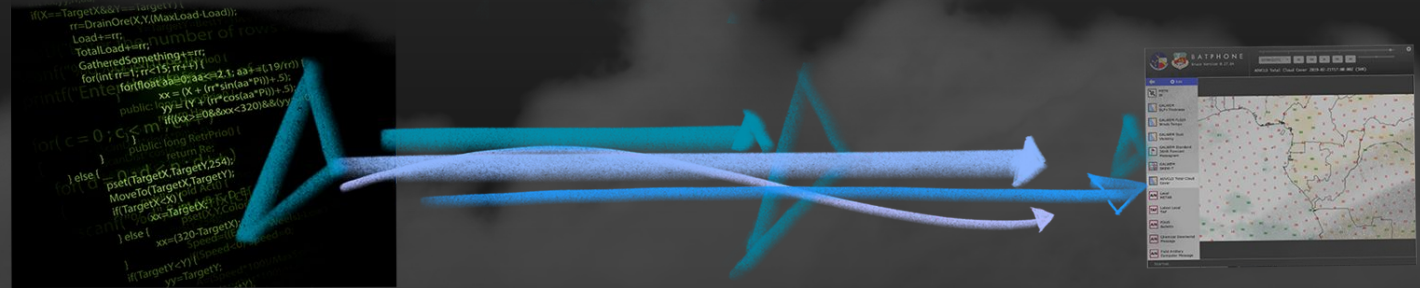
Mission

Rapidly innovate, exploit, and operate cutting-edge software applications to generate environmental and Information Warfare insights to support national interests



Vision

A high performing team empowered to take calculated risk to solve problems, accelerate change, and bring the future faster





Current Global Capabilities

Global Air-Land Weather Exploitation Model (GALWEM)

- USAF version of Unified Model
- Operational since 2016
- Current configuration (OS3) based on UKMO OS4I
 - UM 10.9; N768 (17 km)
 - Runs 4x per day (240h)
 - **NEW:** Running from UKMO generated analyses, no longer doing DA locally



Global Ensemble Capabilities

Global Ensemble Prediction Suite (GEPS)

- 63 members from NCEP, CMC, FNMOC
- Tailored products specific to USAF needs
- 2x daily to 16 days

GALWEM Global Ensemble (GE)

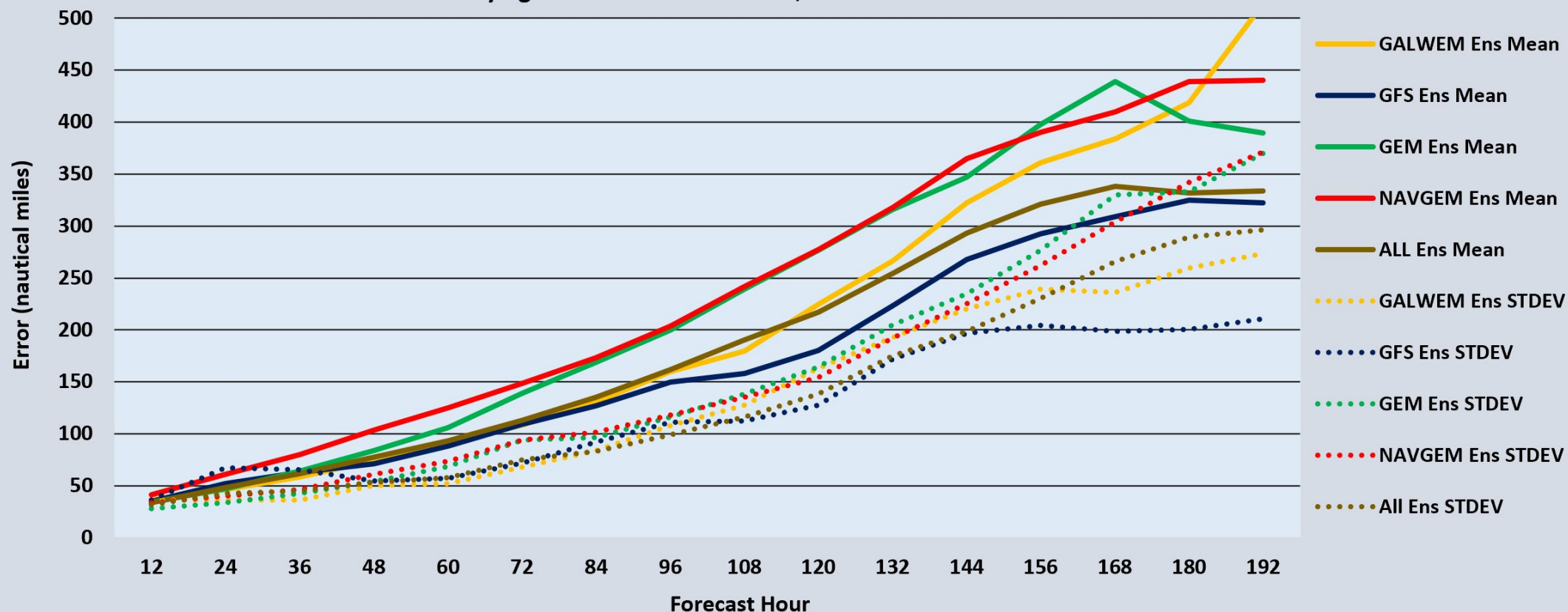
- 21 members at 40 km (half-degree output) run at 557 WW
 - Currently running from local DA, planning to switch to use UKMO inputs
- 16 day forecasts
- Blend in with other 63 in GEPS for improved global ensemble (+4.4%)
- Generate TC tracker bulletins for each member

2021 Atlantic Basin Track Verification Summary

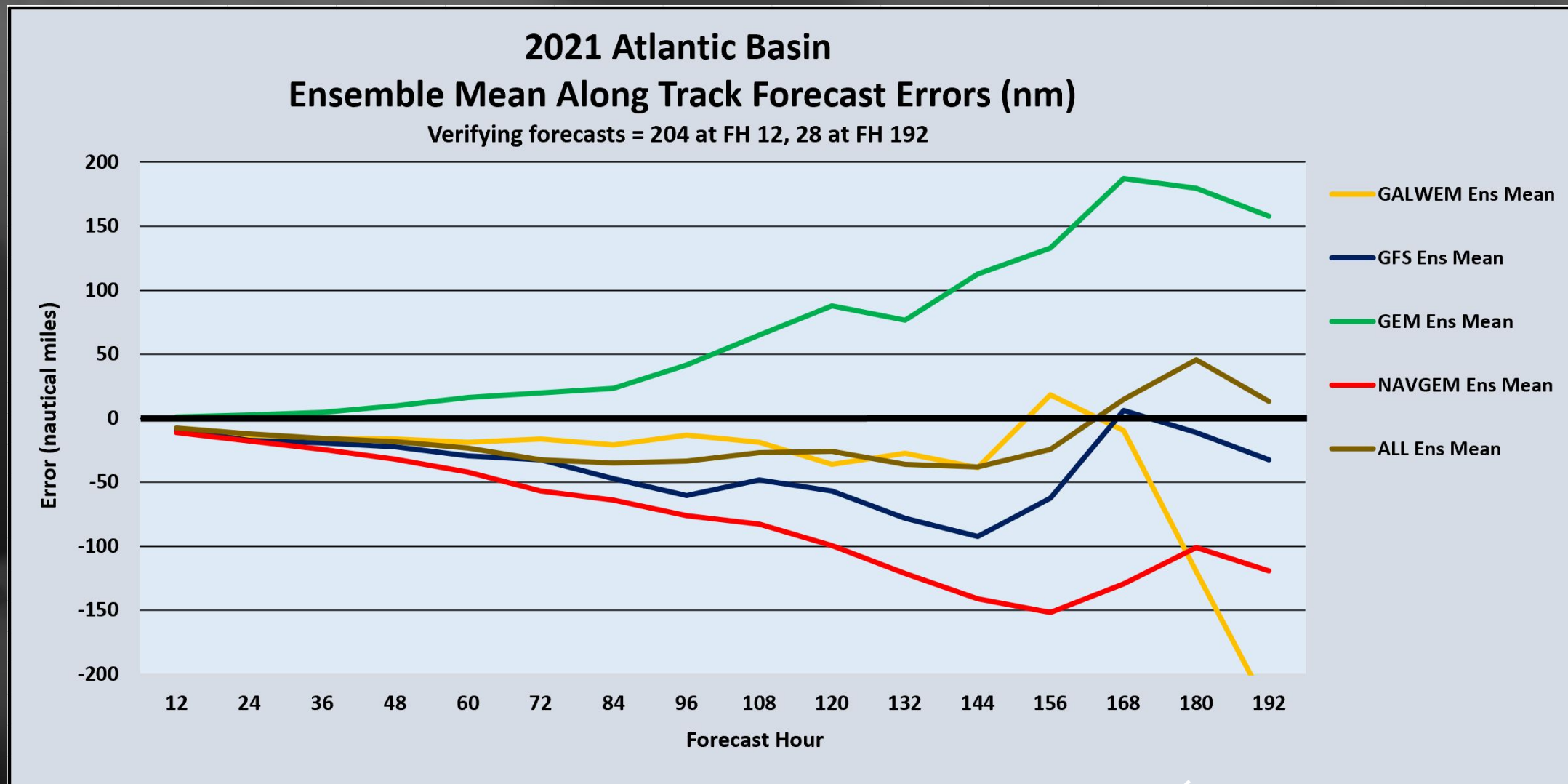


2021 Atlantic Basin Ensemble Mean Track Forecast Errors and Standard Deviation (nm)

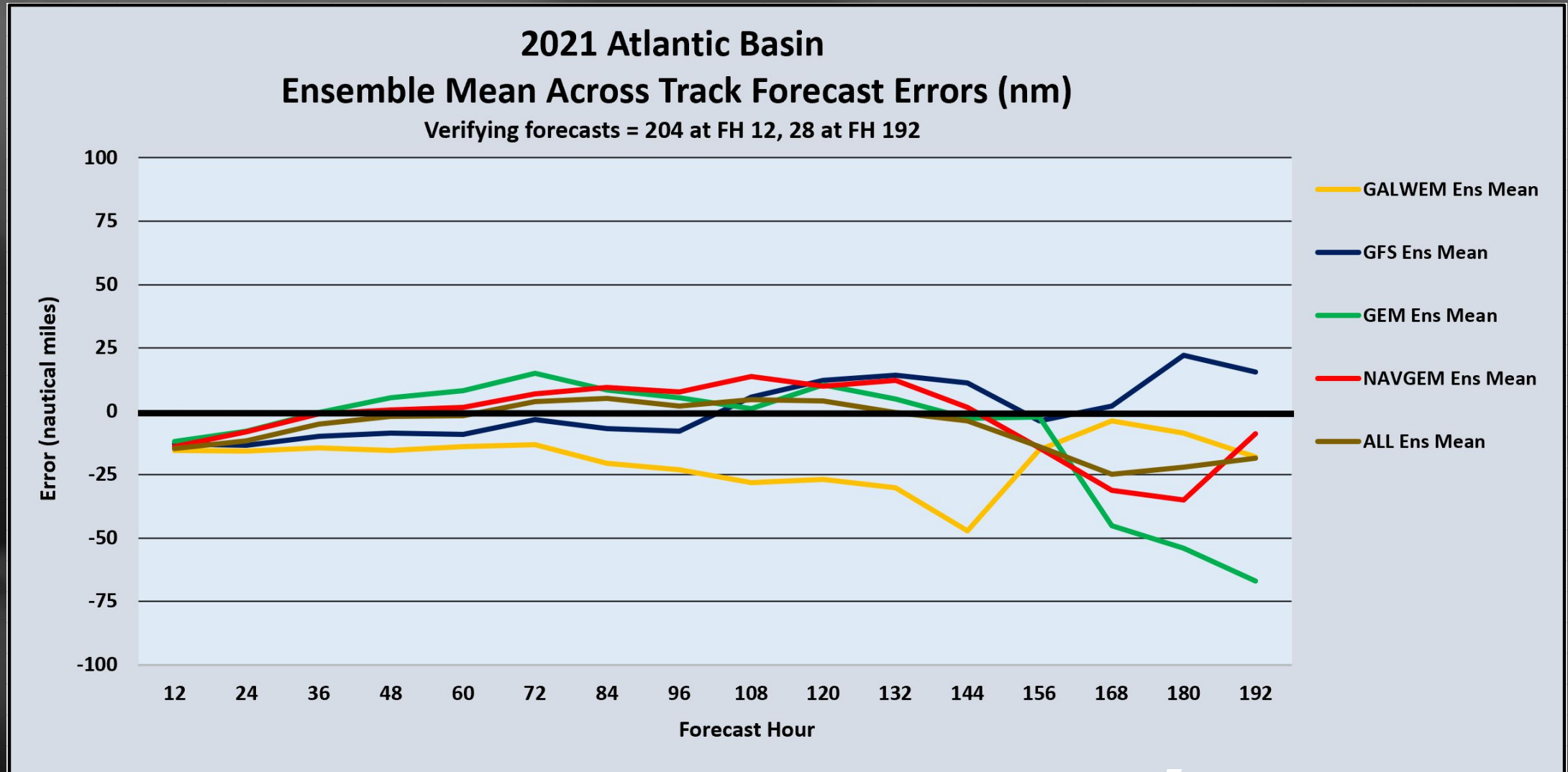
Verifying forecasts = 204 at FH 12, 28 at FH 192



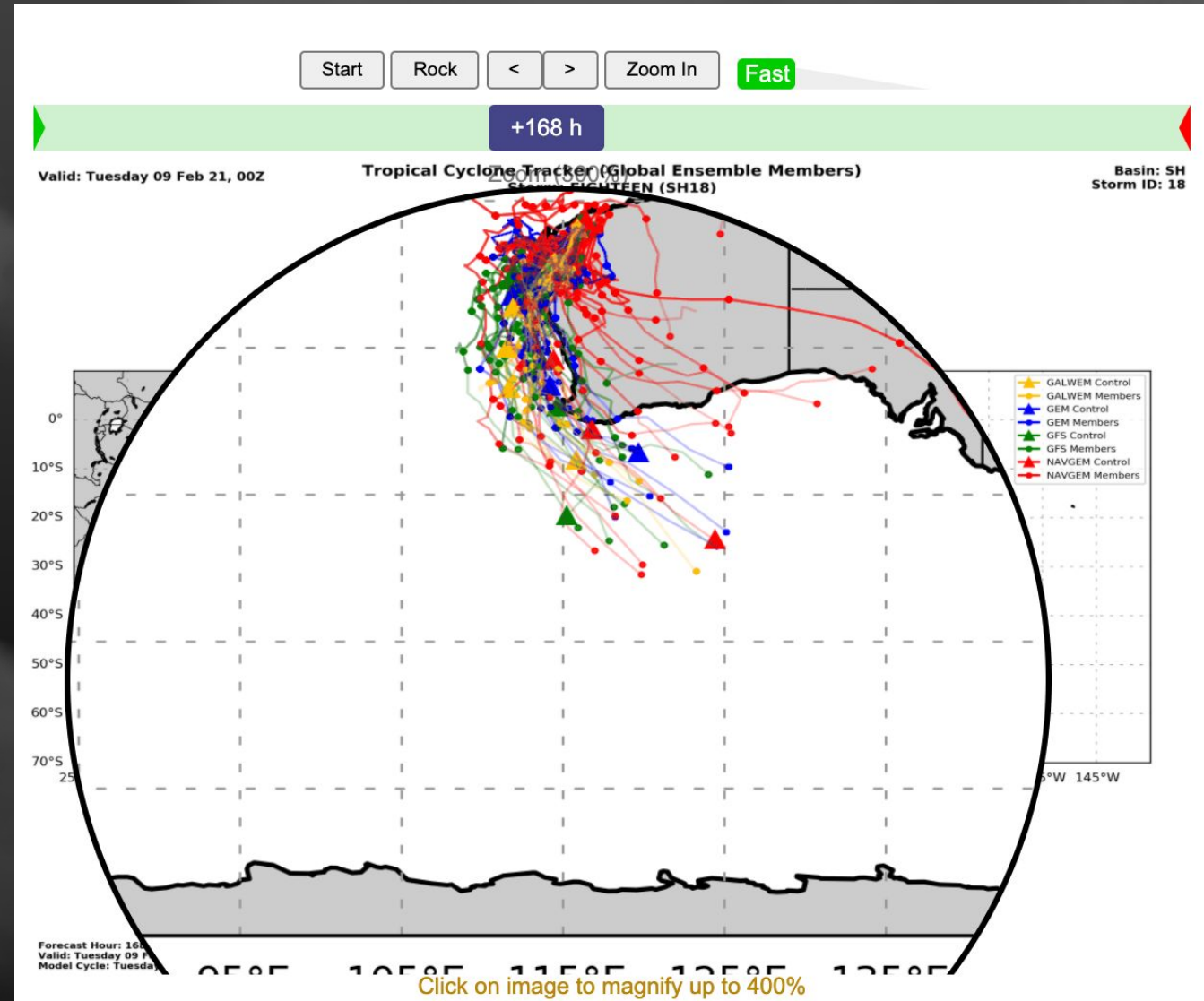
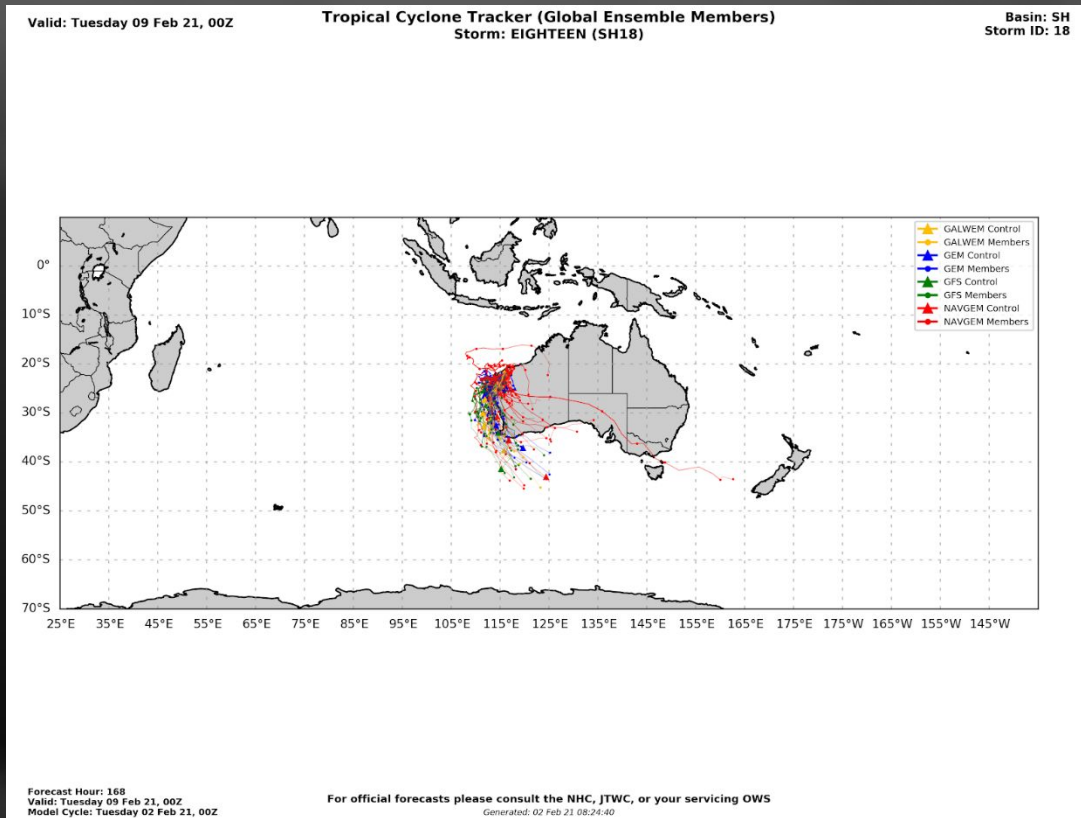
2021 Atlantic Basin Track Verification Summary



2021 Atlantic Basin Track Verification Summary



TC tracker products

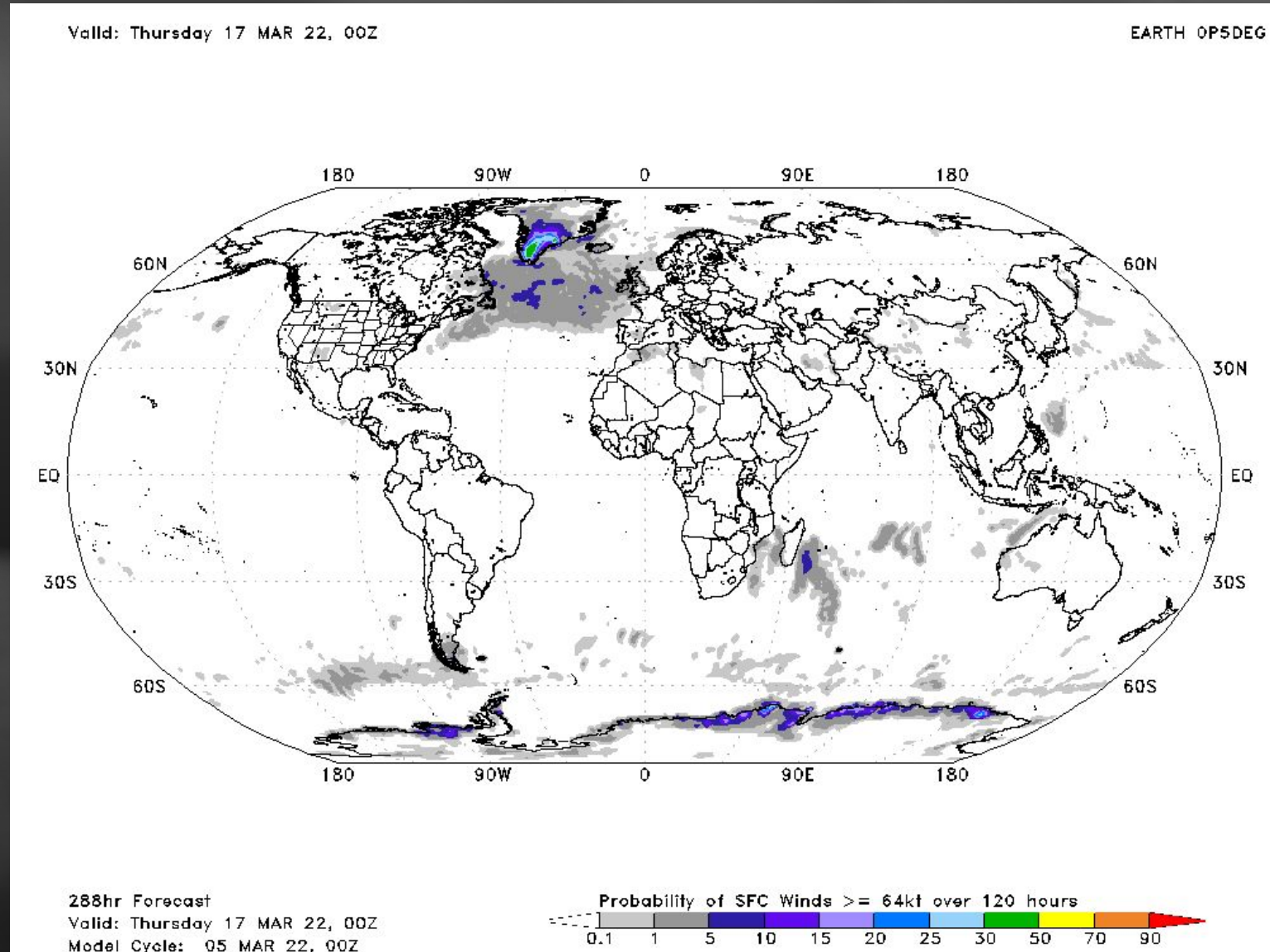


5-day smears in GEPS



Probability of exceeding 34, 64, and 96 knots in the previous 120 hours

Designed for long-range forecasts where timing/location uncertainties are high, to better show areas of TC potential





Regional Capabilities

Mesoscale Ensemble Prediction System (MEPS)

- 16 members of WRF-ARW with diverse initial conditions and varied physics packages (Time Lagged)
- “Global” at 20 km resolution (to 144h)
- Regional at 4 km (to 72h) and 1 km (to 30h)
- Domains moved/modified frequently as mission needs dictate
- ~130M product views last 365 days from 10K unique users
- For the tropical challenge—4 km ensemble provides detailed specifics on local impacts, beyond what storm center/max wind products provide

How to use this product

[illegible]



Plans

- Capability migration to new supercomputer at Oak Ridge National Laboratory
 - GALWEM deterministic to 240 hours already there operationally
 - MEPS/GEPS planned operations summer 2022
 - 21 members of GALWEM-GE at 0.25 degree output to 16 days summer/fall 2022
 - Software deployed from GitLab CI/CD pipeline
 - Automated security/quality checks
 - Enables rapid deployment of capability modifications
- MEPS efforts
 - Upgrade WRF to 4.3.3 and utilize increased computing power for more members/more sophistication
 - More research on value-added from more members, finer resolution, varied initial conditions, etc
 - Rapid Refresh research OCONUS
- Cloud efforts
 - Utilize scalable resources to move towards a more on-demand regional modeling posture
 - Potential for "pay to play" approach to running regional models

Questions or Comments?



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